Method and Apparatus of the Chemical Metal Organic Vapor Epitaxy for the Multi-chamber epitaxy layer deposition

Background of the Invention

1. Field of the Invention

The present invention is to provide a method and an apparatus of the chemical metal organic vapor epitaxy for the multiple-chamber epitaxy layer deposition. More particularly, the present invention is used to produce a LED component for the method and the apparatus of the chemical metal organic vapor epitaxy in the multiple-chamber epitaxy layer deposition. By using the method and the apparatus of the chemical metal organic vapor epitaxy for the multi-chamber epitaxy layer deposition, it can fast implement LED component thereto shortens the manufacturing time.

2. Description of the Prior Art

The structure of LED component mainly comprises: a substrate; an epitaxy layer, an epitaxy layer comprising a N-type epitaxy layer; an active area and a P-type epitaxy. The substrate can be a sapphire substrate, and the epitaxy generally can be GaN. More, they mostly are formed on the substrate by using chemical vapor phase epitaxy.

The method of chemical vapor phase epitaxy used in the

conventional technique requires to be implemented in the same reaction chamber. Therefore, the epitaxy layers with different types in the epitaxy process need to grow in order and the consumption time will grow accumulatively. For example, the required time for growing N-type epitaxy layer needs fours hours, and the required time for growing P-type epitaxy layer needs one hour. If the substrate needs to contain a N-type epitaxy layer and a P-type epitaxy layer, then, it needs to take four hours for its reaction time.

According to the above description, the present invention is to provide a method and an apparatus of the chemical organic vapor epitaxy for the multi-chamber epitaxy layer deposition. By using an apparatus of the chemical metal organic vapor epitaxy for the multi-chamber epitaxy layer deposition with multiple reaction conditions, it can make multiple epitaxy layers individually react by period adjustment thereto shorten the manufacturing time.

Summary of the Invention

The present invention is to provide an apparatus of the chemical metal organic vapor epitaxy for the multiple-chamber epitaxy layer deposition. The main feature of the present invention is that the apparatus of the chemical metal organic vapor epitaxy for the multi-chamber epitaxy layer deposition is with multiple chambers.

The multiple chambers are with multiple reaction conditions. Further, it can make multiple LED components form multiple epitaxy layers thereto shorten the manufacturing time.

Another purpose of the present invention is to provide a method of the chemical metal organic vapor epitaxy for the multi-chamber epitaxy layer deposition. By using the method and of the chemical metal organic vapor epitaxy for the multi-chamber epitaxy layer deposition, it can implement multiple LED components and make different types of epitaxy layers individually react by period adjustment at the same time. Further, it can make different types of LED components form different types of multiple epitaxy layers thereto shorten the manufacturing time.

For a more complete understanding of the present invention and for further advantages thereof, reference is now made to the following description taken in conjunction with the accompanying drawing, in which:

Brief Description of the Drawings

Figure 1 is one of the preferred embodiments according to the present invention showing the apparatus of the metal organic chamber vapor epitaxy for the multi-chamber epitaxy layer deposition; and

Figure 2 is one of the preferred embodiments according to the present invention showing the flow chart of the metal organic chamber vapor epitaxy for the multi-chamber epitaxy layer deposition.

Detailed Description of the Preferred Embodiments

The present invention is to provide an apparatus of the chemical metal organic vapor epitaxy for the multi-chamber epitaxy layer deposition. The apparatus is used to produce a LED component, which includes: Multiple chambers, the multiple chambers are arranged along the periphery; Multiple supporting bases, and the supporting bases are used for supporting substrate, and are individually positioned in the chambers; A pick-up apparatus, the apparatus is positioned in the center of the circle and are with at least one robotic arm and one rotated chassis. It uses therotated chassis to shift the robotic arm, and then uses the robotic arm to pick up the substrate for the change in between the multiple chambers.

For the description of the preferred embodiment in the present invention, the growth for the epitaxy layer of LED generally requires at least five hours to implement. This may includes four hours in N-type epitaxy layer and one hour in P-type epitaxy layer. In order to shorten the manufacturing time, the present invention uses the reaction period of P-type epitaxy layer as a unit to divide the reaction period of N-type epitaxy layer as four stages. The reaction in each stage uses the chamber of its individual reaction condition to process reaction. Please referring to Figure 1, it is one of the preferred embodiments according to the present invention showing the

apparatus of the metal organic chamber vapor epitaxy for the multi-chamber epitaxy layer deposition. The apparatus comprises: Five chambers 10, 20, 30, 40, and 50, and the multiple chambers are arranged along the periphery; Five supporting bases 11, 21, 31, 41, and 51, and the top side of the supporting bases is used for supporting a substrate 70, and the supporting bases are individually positioned in the multiple chambers; A pick-up apparatus 60, and the apparatus 60 is positioned in the center of the circle; And at least a robotic arm 61 and a rotated chassis 62. It uses the rotated chassis 62 to shift the robotic arm 61, and then uses the robotic arm 61 to pick up the substrate. The substrate 70 then can change between the multiple chambers.

Further, the method of the chemical metal organic vapor epitaxy for the multiple-chamber epitaxy layer deposition in the present invention can process multiple epitaxy reactions of the LEDs components at the same time. More, it can make different types of epitaxy layers individually react by period adjustment at the same time. The method comprises: Providing multiple chambers; Forming multiple substrates, and each chamber has its individual reaction condition; Forming multiple substrates, and the multiple substrates are put into different chambers; Forming a first epitaxy layer, and the first epitaxy layer is on the substrate; The substrate is put into a

P-type chamber, and the second chamber is removed to the multiple chambers to form the first epitaxy layer of the second substrate; Forming the second epitaxy layer, the second epitaxy layer is on the first epitaxy layer. The substrate is removed from the P-type chamber, and then the second substrate is removed to the P-type chamber for growing the second epitaxy layer of the second substrate. The first epitaxy layer is implemented by in-out processes between the multiple chambers. Also, the reaction time of each chamber is the growth time of the second epitaxy layer. The reaction condition for each chamber at least comprises a carrier gas, a precursor, and a tolerated temperature range. The carrier gas can be H, and the precursor can be one of BC13 and PC13, BC13 and PH13, and NH3.

Further description in the method of the chemical metal organic vapor epitaxy for the multi-chamber epitaxy layer deposition can be shown in the present invention, please referring to Figure 2. It is one of the preferred embodiments according to the present invention showing the flow chart of the metal organic chamber vapor epitaxy for the multi-chamber epitaxy layer deposition. First, it uses the growth time for P-type epitaxy layer as a unit. Then, it divides the reaction time of N-type epitaxy layer as four stages. The reaction of each stage uses the chamber with its individual reaction condition to process reaction, which can divide as: the reaction period for the first

chamber PN1, the reaction period for the second chamber PN2, the reaction period for the third chamber PN3, the reaction period for the fourth chamber PN4, and the reaction period for the fifth chamber PP1.

Following the above step, please referring the reaction period of each chamber PN, it forms multiple substrates. Firstly, the first substrate performs reaction for one hour in the first chamber. The first type of the epitaxy layer is formed on the substrate. Then, the substrate is removed from the first chamber and to the second chamber. More, the second substrate is removed to the first chamber. After two hours later, the first type of the first epitaxy layer forms a second type of the first epitaxy layer. Then, the substrate is removed from the second chamber to the third chamber. Further, the second substrate is removed to the second chamber. The second substrate, in the meantime, forms the second type of epitaxy layer on it. Then, it repeats above steps until to the fourth hours. Here at least a substrate can form all the first epitaxy layers, and the first epitaxy layers of another substrates are gradually formed. In the meantime, the substrates with the first epitaxy layers are removed from the chamber, and to the fifth chamber for growing the second epitaxy layer. After that, the substrate with the first epitaxy layer is removed to the fifth chamber every hour for processing the growth of the second epitaxy layer.

In conclusion, the present invention meets novelty, improvement, and is applicable to the industry. It, therefore, meets the essential elements in patentability. There is no doubt that the present invention is legal to apply to the patent, and indeed we hope that this application can be granted as a patent.

Although the present invention has been described in detail with respect to alternate embodiments, various changes and modifications may be suggested to one skilled in the art, and it should be understood that various changes, suggestions, and alternations can be made hereto without departing from the spirit and scope of the invention as defined by the appended claims.